

What is claimed is:

1. A shielding gas for use in the arc welding of metallic work pieces, comprising:  
    argon, carbon dioxide, between about 4.5% and about 15% by volume of  
    nitrogen, and substantially no helium; or  
    argon, carbon dioxide, helium, and between about 3% and about 15% by volume  
    of nitrogen.
2. The shielding gas of claim 1, wherein the shielding gas comprises argon, carbon  
    dioxide, between about 5% and about 14% by volume of nitrogen, and substantially  
    no helium; or argon, carbon dioxide, helium, and between about 4% and 14% by  
    volume of nitrogen.
3. The shielding gas of claim 1, wherein the shielding gas comprises argon, carbon  
    dioxide, helium, and between about 4.5% and 15% by volume of nitrogen.
4. The shielding gas of claim 3, wherein the shielding gas comprises argon, carbon  
    dioxide, helium, and between about 5% and 14% by volume of nitrogen.
5. The shielding gas of claim 1, wherein the shielding gas comprises between about 5%  
    and about 12% by volume of nitrogen.
6. The shielding gas of claim 5, wherein the shielding gas comprises between about 5%  
    and about 10% by volume of nitrogen.
7. The shielding gas of claim 5, wherein the shielding gas comprises between about 6%  
    and about 9% by volume of nitrogen.
8. The shielding gas of claim 1, wherein the shielding gas comprises between about  
    0.001% and about 5% by volume of carbon dioxide.

9. The shielding gas of claim 8, wherein the shielding gas comprises between about 0.005% and about 2% by volume of carbon dioxide.
10. The shielding gas of claim 8, wherein the shielding gas comprises between about 0.01% and about 1% by volume of carbon dioxide.
11. The shielding gas of claim 8, wherein the shielding gas comprises between about 0.1% and about 0.75% by volume of carbon dioxide.
12. The shielding gas of claim 1, wherein the shielding gas comprises about 70% or less by volume of helium.
13. The shielding gas of claim 1, wherein the shielding gas comprises between about 1% and about 50% by volume of helium.
14. The shielding gas of claim 13, wherein the shielding gas comprises between about 2% and about 30% by volume of helium.
15. The shielding gas of claim 13, wherein the shielding gas comprises between about 3% and about 20% by volume of helium.
16. The shielding gas of claim 13, wherein the shielding gas comprises between about 5% and about 10% by volume of helium.
17. A shielding gas for use in the arc welding metallic work pieces, consisting essentially of:
  - argon, carbon dioxide, between about 4.5% and about 15% by volume of nitrogen, and substantially no helium; or
  - argon, carbon dioxide, helium, and between about 3% and about 15% by volume of nitrogen.

18. The shielding gas of claim 17, wherein the shielding gas consists essentially of between about 0.001% and about 5% by volume of carbon dioxide.
19. The shielding gas of claim 17, wherein the shielding gas consists essentially of about 70% or less by volume of helium.
20. In a method for arc welding of metallic work pieces using consumable electrodes, the improvement comprising:
- Supplying a shielding gas stream to a work piece adjacent to an electrode, wherein the shielding gas comprises argon, carbon dioxide, between about 4.5% and about 15% by volume of nitrogen, and substantially no helium; or argon, carbon dioxide, helium, and between about 3% and about 15% by volume of nitrogen.
21. The method of claim 20, wherein the method of arc welding is MSG welding.
22. The method of claim 20, wherein the method of arc welding is MAG welding.
23. The method of claim 20, wherein the work piece is composed of a rust-proof steel.
24. The method of claim 23, wherein the work piece is composed of a material selected from the group consisting of nickel-based materials, specialty steels, and high-alloy steels.
25. The method of claim 20, wherein the shielding gas comprises argon, carbon dioxide, between about 5% and about 14% by volume of nitrogen and substantially no helium; or argon, carbon dioxide, helium, and between about 4% and 14% by volume of nitrogen.
26. The method of claim 20, wherein the shielding gas comprises argon, carbon dioxide, helium, and between about 4.5% and 15% by volume of nitrogen.

27. The method of claim 26, wherein the shielding gas comprises argon, carbon dioxide, helium, and between about 5% and 14% by volume of nitrogen.
28. The method of claim 20, wherein the shielding gas comprises between about 5% and about 12% by volume of nitrogen.
29. The method of claim 28, wherein the shielding gas comprises between about 5% and about 10% by volume of nitrogen.
30. The method of claim 28, wherein the shielding gas comprises between about 6% and about 9% by volume of nitrogen.
31. The method of claim 20, wherein the shielding gas comprises between about 0.001% and about 5% by volume of carbon dioxide.
32. The method of claim 31, wherein the shielding gas comprises between about 0.005% and about 2% by volume of carbon dioxide.
33. The method of claim 31, wherein the shielding gas comprises between about 0.01% and about 1% by volume of carbon dioxide.
34. The method of claim 31, wherein the shielding gas comprises between about 0.1% and about 0.75% by volume of carbon dioxide.
35. The method of claim 20, wherein the shielding gas comprises about 70% or less by volume of helium.
36. The method of claim 20, wherein the shielding gas comprises between about 1% and about 50% by volume of helium

37. The method of claim 36, wherein the shielding gas comprises between about 2% by volume and about 30% by volume of helium.
38. The method of claim 36, wherein the shielding gas comprises between about 3% by volume and about 20% by volume of helium.
39. The method of claim 36, wherein the shielding gas comprises between about 5% by volume and about 10% by volume of helium.